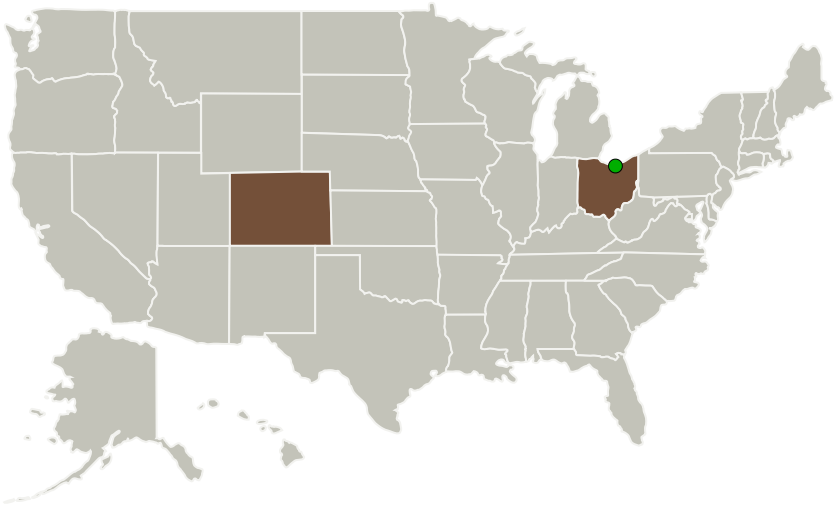
Lunar Organic Waste Reformer, Phase II

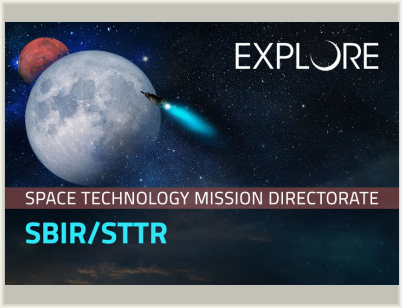
Completed Technology Project (2011 - 2013)

Project Introduction

The Lunar Organic Waste Reformer (LOWR) utilizes high temperature steam reformation to convert all plastic, paper, and human waste materials into useful gases. In the LOWR, solar thermal concentrators are used to heat steam directly to 600 C, after which the steam is mixed with a small amount of oxygen and injected into a reactor which is being fed with waste materials via a lock hopper. At the high temperatures, the oxygenated steam will react with all organic materials to produce a gas mixture largely composed of hydrogen, CO and carbon dioxide. After removing the remaining steam from the product stream via condensation, the gases are dusulfurized and then fed to a catalytic reactor where they can be combined with hydrogen to produce methane, methanol, or other fuels. Both the necessary hydrogen and oxygen for the process can be produced by electrolysis of part of the water content of the waste material, which is extracted from the wastes directly by the reformer itself. With effective recycling of the steam, no consumables are lost in the process. All products are liquids or gases, making the system highly reliable and subject to automation. In the proposed Phase 2 program, Pioneer Astronautics will build a full-scale end-to-end LOWR system capable of turning 10 kg of waste per day into methane and oxygen.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Pioneer Astronautics	Lead Organization	Industry Historically Underutilized Business Zones (HUBZones)	Lakewood, Colorado
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Colorado	Ohio

Project Transitions

June 2011: Project Start

June 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139067)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Pioneer Astronautics

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Robert M Zubrin

Co-Investigator:

Robert Zubrin

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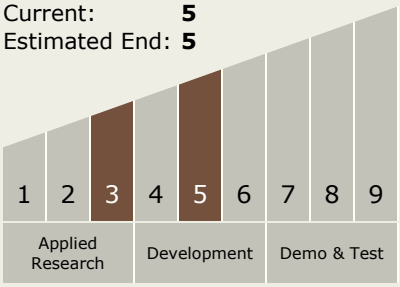
Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.2 Mission Infrastructure, Sustainability, and Supportability
    - TX07.2.1 Logistics Management

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System